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RECENT RESEARCH IN CUTANEOUS SENSITIVITY: II. TOUCH AND THE NEURAL BASIS OF THE SKIN SENSES

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This paper concludes our review of recent experimental investigations in the field of cutaneous sensitivity. The first section¹ covered the work on pain and temperature sensitivity, while our present task is concerned with studies on touch and with the evidence concerning the nature of peripheral cutaneous nerve function.

TOUCH

Under this heading we consider only those studies which deal with the sensitivity of the skin to simple mechanical stimulation. *Kinesthetic-tactile* phenomena are deliberately omitted, since the cutaneous contribution is usually trivial and consists essentially in providing cues for appropriate manipulation or for kinesthetic orientation in space. *Sensitivity to vibration*, to be sure, appears to be predominantly cutaneous, but an excellent review of the literature has recently been prepared by Geldard,² and duplication here is unnecessary.

Distribution of Sensitivity. The classical theory of relatively fixed, discrete points of sensitivity or 'touch spots,' presumably corresponding to specific end-organs (possibly hair bulbs and Meissner corpuscles), has not escaped criticism. Guilford and Lovewell (43) mapped the same cutaneous area repeatedly with a series of hair stimulators and found that the number of sensitive points increased with the pressure exerted by the stimulator. This parallels

¹ Stone, L. J., & Jenkins, W. L. Recent research in cutaneous sensitivity: I. Pain and temperature. *Psychol. Bull.*, 1940, 37, 285-311.

² Geldard, F. A. The perception of mechanical vibration: I. History of a controversy. *J. gen. Psychol.* 1940, 22, 243-269.

the findings of Heiser³ in the case of warmth, suggesting that a given map holds good only for very restricted stimulus conditions. Roy (86) likewise reports that he finds no regions absolutely anesthetic to touch, provided the stimulation is sufficiently intense. Such results might be explained in terms of mechanical spread of strong stimulation or by the presence of end-organs of varying thresholds. Guilford and Lovewell offer the hypothesis that every point on the skin surface has its own threshold and its own psychometric function, implying that the entire skin is sensitive to some extent and that the 'spots' which are usually mapped are merely peaks of sensitivity. However, they fail to eliminate experimentally the factor of mechanical spread, offering only a logical explanation based on the extent of experienced spread reported.

More direct evidence seems to be provided by the work of Becker and Fröhle (6). They located several groupings of three highly sensitive 'touch spots.' In each case, the limen of a point at the center of the triangle was so high as to suggest (on the basis of the traditional theory) that its sensitivity was merely a function of simple spread of stimulation to the surrounding sensitive points. Indeed, punctiform anesthesia of these three points did further raise the limen at the center, showing this to be a genuine factor. However, anesthesia of the *center point* alone also raised its threshold, indicating that its sensitivity must have been, in part, a local matter. The remaining possibility, that there might have been a diffusion of the anesthetic to the corner points, was eliminated by control injections between the center and the corners, which did not affect any of the four limens. These results necessitate the abandonment of the punctiform theory in its rigid traditional form, or at least its modification to include 'touch spots' of exceedingly low sensitivity.

The presence of highly sensitive points to the 'windward' of hairs has long been recognized. Some years ago, Stetson⁴ emphasized the importance of the action of the hair as a second-class lever in deforming the skin and secured interesting results with artificial 'hairs' inserted in the skin. Raffel (79) found that complete removal of a hair with tweezers does not reduce the sensitivity

³ Heiser, F. Stimulus temperature and thermal sensation. *Arch. Psychol.*, N. Y., 1932, 21, No. 138.

⁴ Stetson, R. H. The hair follicle and the sense of pressure. *Psychol. Monogr.*, 1923, 32, Whole No. 145, 1-17.

of the 'windward' spots to that of the rest of the skin. Although the hair, when in place, may act chiefly to deform the skin, as Stetson suggests, Raffen's work also demonstrates the presence of localized sensitivity at the points in question.

Adaptation. Zigler (102) measured the time for complete adaptation when stimulators of varying weight and area were placed on the skin. Although the times generally increased with weight and decreased with area, all of them are so short as to provide little justification for Zigler's assumption of a linear relation between adaptation time and stimulus intensity. Crook and Crook (16) employed a succession of much heavier weights and obtained correspondingly longer adaptation times, which were clearly not in a linear relation but followed a somewhat irregular curve of negative acceleration. As Zigler points out (104, p. 434), it is possible that more than simple cutaneous stimulation may have been responsible for this result.

A special phase of adaptation has been studied, principally from a clinical viewpoint, under the term 'threshold lability.' Here the significant point is that adaptation occurs with intermittent stimulation at threshold intensity. Although this was earlier considered as a symptom of certain organic lesions, Tschlenoff (99) demonstrated that it also occurred normally under specific conditions. Beringer and Ruffin (7) found 'lability' under conditions of acute fatigue as well as in schizophrenics and alcoholics with no organic lesions. Ruffin (88) checked these results by chronaxy determinations which roughly paralleled the usual threshold measurements, but proved less reliable. Von Bagh and Rysä (4) studied systematically the influence upon the phenomenon of varying rates of intermittent stimulation, using pathological cases known to show 'lability.' In general, the fading occurred more rapidly at higher frequencies of stimulation, but in some individuals the rate seemed to have no influence. Periodic disappearance and reappearance were not uncommon. It seems probable that 'threshold lability' and adaptation to supraliminal stimulation are manifestations of the same basic processes, with the contributions of central and peripheral factors still to be clearly determined. Further systematic study is needed. An investigation by Freiberg (33) includes some data on adaptation with near-liminal stimulation, although his chief interest is in showing that fluctuation of attention cannot be demonstrated under these conditions.

Evidence for a specific chemical basis for tactile adaptation in the skin of the frog has come from a series of studies, principally by Hoagland and his co-workers. Utilizing the technique of recording antidromic action currents as developed by Adrian, Cattell, and Hoagland (1), Hoagland (52, 53, 54) made quantitative measurements of adaptation to air-jet stimulation under a variety of experimental conditions. On the basis of these and earlier results, he offered the hypothesis that adaptation was due to the action on the nerve endings of potassium released by non-nervous cells of the skin. Rubin (87) and Hoagland and Rubin (57) showed that potassium is present in the skin and that it is released from the epithelial cells by mechanical stimulation. Meanwhile, in Adrian's laboratory, Feng (28) demonstrated that bathing the skin in K-free Ringer's solution delayed adaptation, while a K-rich solution hastened it, and also broadened the implications of the work by showing that it applied to mammalian (cat) skin. Talaat (92) used a variety of solutions and found calcium more effective than potassium in hastening adaptation. Hoagland (55) reconciled these findings by showing that—while both ions accelerate adaptation—the potassium effect is produced more quickly and is reversible, while that of calcium is not. Dun and Finley (25) confirmed Talaat's findings regarding calcium and also discovered a bimodal distribution of adaptation times when the stimulus was a sudden stretching of the skin. The *rapidly adapting* discharge appeared only with sudden applications of force, but its duration showed no dependence upon the magnitude of the force. The duration of the *slowly adapting* discharge was increased by the use of greater force, but seemed less dependent on the rate of change. These findings on the skin of the frog can be applied to the human being only cautiously by analogy. Yet the evidence is extremely suggestive of possibilities for further work in this field.

Discrimination of Intensity. A paradoxical effect of adaptation in heightening, rather than diminishing, the fineness of discrimination of intensity differences was suggested by Kolbe (61). The just-noticeable increment of weight was determined after a stimulator had been applied to the skin for varying periods of time. Kolbe claimed that the difference limen decreased with time, up to 12 seconds, and thus was related to the decreasing *phenomenal* intensity experienced from the original weight, as a result of adaptation. Close examination of his data, however, shows that reliably higher values for the difference limen were found only after very

short applications (3 seconds and less) of the original stimulus. A more conservative interpretation than Kolbe's is that these very brief periods before the extra weight was added gave less adequate opportunity for accurate comparisons.

Another radical concept is advanced by Holway and Crozier (59), who dispute the Von Frey-Kiesow view that the perimeter of the stimulator is the critical dimension in mechanical stimulation of the skin. In the light of the considerable body of evidence which supports the older view, the experimental technique of Holway and Crozier needs to be critically examined. Resting circular and annular glass vessels on the skin, they added water at a uniform rate until a just-noticeable increase was reported. Their results show the difference limen to be proportional to the increase in hydrostatic pressure (weight per unit area) without regard to the form of the stimulator. As long ago as 1896, Stratton⁶ showed that this method of continuous addition until the subject reacts, yields entirely different results from those obtained when the increments are discrete and instantaneous. Another shortcoming of this technique for the particular purpose is that, if Holway and Crozier are correct in their final conclusions, the subject will necessarily be responding after a fixed number of seconds have elapsed, regardless of the form of the stimulator. A simple set to respond after such a fixed period must therefore be controlled somehow by the experimental method. In any event, confirmation by a less equivocal technique would seem to be in order. These criticisms also apply to the same authors' 'availability theory': the view that differential discrimination depends upon the total number of receptors remaining available, since the evidence for this was also secured by the method of continuous addition (58). In fairness, however, it must be pointed out that this theory seems to have been well demonstrated by them in other sensory fields, such as vision.

Increased sensitivity as a result of practice was suggested by Eidinova (27), who found different relationships between the values for sensitivity of the radial and ulnar regions of the hand in subjects of different occupations, such as violinists, gynecologists, and users of Braille.

Grindley (41, 42) showed that the absolute and difference limens were increased by slow rates of application of the stimulus

⁶ Stratton, G. M. Ueber die Wahrnehmung von Druckänderungen bei verschiedenen Geschwindigkeiten. *Philos. Stud. (Wundt)*, 1896, 12, 525-586.

and that a decrease in pressure was generally more difficult to discriminate than an increase. Bohnenkamp, Schaefer, and Schmäh (10) used a device which made it possible to stimulate the forehead simultaneously with as many as 16 punctiform stimulators. They discovered indications of summation effects, although the exact relation between threshold pressure and number of stimulators is not very clear. Costa (14) demonstrated that Weber's law holds approximately for the discrimination of intensity differences between two punctiform pressures, even when they are applied simultaneously instead of by the traditional method of successive stimulation.

Hines (50) applied hair stimulators through tiny holes in a loaded disk resting on the skin and discovered that the limens were higher with greater loads on the disk. While he favors the view that this effect is largely a function of the reduced blood supply to the stimulated point, two other possibilities must not be overlooked. First, the tension of the skin across the hole may make further deformation by the hair more difficult—a purely mechanical effect. Second, the disk itself may be producing adaptation in the receptors beneath the hole. A partial check on these factors could be made by testing the limens successively after varying periods of loading.

Measurement of Skin Deformation. It has long been recognized that the deformation of the skin produced by a stimulator may be a more significant parameter than stimulus pressure in determining the intensity of experience. Several new methods of measuring the depth of deformation have been devised. (To date, determination of its areal extent has defied the ingenuity of experimenters, although its fundamental importance has been recognized.) Gatti (35, 36) describes two different techniques of measurement and also derives a formula in which the depth of deformation produced by a fine stimulator on the finger is related to the two-thirds power of the applied weight. When his figures for the difference limen in terms of pressures were converted by this formula into equivalent deformation-depths, a greater constancy of the RDL was obtained.

Bernfeld and Feitelberg (8) developed a formula in which deformation-depth is related to the maximum possible depression of the stimulator, thus taking account quantitatively of the variations in underlying tissues which vastly affect the deformations obtained. According to their experimental results, the difference limen in

terms of deformation-depth is always a constant fraction of the remaining available depressibility. This would fit in nicely with the 'availability theory' of Holway and Crozier.⁶

By far the most extensive measurements in this field were made by Von Bagh (2), who employed a wide variety of stimulus weights and areas. He found the absolute limen directly proportional to the depth of skin deformation, regardless of stimulator size. Similarly, supraliminal stimuli giving equal deformation-depths were reported as equally intense, as long as the variations of size and weight did not exceed certain limits. The same held good for stimulation with two stimulators, provided they were close enough to produce virtually a single deformation. Beyond these limits, various complex relations prevailed. In the discrimination of intensity differences, Von Bagh could not confirm Bernfeld and Feitelberg's simple formula, but suggests a varying relationship depending upon the weight and area of the stimulus. He interprets his findings as supporting a theory of a dual system of cutaneous and subcutaneous sensitivity, with the latter involved only where stimulation is relatively heavy.

In further experiments, Von Bagh (3) uncovered some interesting individual differences in the schemes of judging equivalence of single and double stimulation, and of stimulators of differing area. Some subjects judged two experiences equal when the depth of skin deformation was the same for both, even when other stimulus conditions were varied widely. Other subjects gave variant results which indicated that the total area of deformation might also play a role, even with small stimulators close together. Most interesting was the one individual who appeared to judge entirely in terms of weight, judging two stimulations to be equally intense whenever the total weight of the double stimulation was equal to that of the single stimulation, although the distances between the double stimuli might be varied widely. Von Bagh believes we are dealing here with 'deformation constancy,' 'weight constancy,' etc.—phenomena similar to those found in other sensory fields. The problem still remains open as to what cues are employed and how they are combined to obtain such constancies of judgment.

Discrimination of Extent. A series of studies has demonstrated clearly that the tactile discrimination of differences in length does not follow Weber's law. In tactile extent, it is the absolute increment and not the percentage difference which remains constant.

⁶ See p. 73.

Danesino (18, 19) showed this to be true both for continuous lines and for a series of points arranged in a straight line. His results were confirmed independently by Gatti (37, 38, 39). Danesino (20) attempted to relate this to diverseness of local signs by showing that the difference limen for extent is approximately equal to the distance between two successive stimulations necessary for them to be perceived as distinct, *i.e.* as having different local signs. It is hard to believe, however, that this explanation can be adequate, except for the special case where the standard and comparison stimuli have a common point of origin and follow a common line. Ricci (84) found approximately the same magnitude for the difference limen when the standard stimulus was applied to one forearm and the comparison stimulus to the other as when both were applied to the same region. Danesino's explanation would not hold when the stimuli are thus applied to different parts of the body.

In the limen for the linearity of three points, Oberto (75) found a similar relation. Regardless of the distances between the points, the necessary displacement of one for it to be perceived as out of line remained a constant number of millimeters. Gatti (38, 39) offers a formula in which the difference limen for spatial discrimination is equated to an assigned power of the cube root of the distance, the value of this power depending upon the sensory system involved. By assigning different values for the power, he is able to compute theoretical values which coincide closely with the experimental findings for visual and tactual extent and linearity. This he takes to indicate that all of these can be brought under a common law. As yet, however, the formula appears to be entirely empirical.

Localization. A considerable number of studies have dealt with tactile localization.⁷ Pritchard (77) and Disher (23), working independently, covered a wide range of stimulus intensities, but could find no statistically significant increase in the accuracy of localization with greater pressures, as some earlier results of Franz had suggested. Hulin (60), following the oft-repeated hypothesis that localization is affected by the usual movement of the part when stimulated, attempted to cut across such tendencies by stimulating the arm during transverse movement, but without conclusive

⁷ Those concerned fundamentally with the relation between the accuracy of touch and pain localization have already been considered in the first section of this review, *op. cit.*, pp. 293-294.

results. Grannis and Walker (40) made a more extensive study utilizing distal-proximal movement of the arm. They found slightly impaired accuracy with both distal and proximal movement, which suggests that the increased error may have been caused by the simple distracting effect of the movement itself and not because it cut across any specific response tendencies. The constant error was distal under all conditions, but this was consistently less when the localization occurred with the arm in the proximal *position*, regardless of the direction of *movement* during stimulation, which constitutes an interesting topic for further investigation.

The effect of training in reducing the error of localization has long been recognized. Munn (72) showed that some slight improvement occurs with practice even when the locus is reported verbally, without any overt localizing movement, and the individual is not informed of the nature of his errors. Franz and Eaton (31) found some evidence that improvement in localization may be transferred to the contralateral limb. Purdy (78) reported a case in which localization remained incorrect after 10 years, following the grafting of a flap of volar skin over on the dorsal side of a finger. Douglas and Lanier (24), on the contrary, found a gradual shift from incorrect to correct localization in the case of a flap swung from the upper to the lower lip with the original nerve supply intact. The difference between these findings is possibly due to the differing opportunities for practice in localization.

Localization with two or more stimulated points adds complications. Mookherjee (68) tested the localization of two points within the two-point limen and reached the unexciting conclusion that the reported locus generally corresponds to the middle. Schöbel (90) utilized two simultaneously stimulated points separated by distances greater than the two-point threshold. He found that the localization reported first was nearly as accurate as with single stimulation. But the experienced locus of the second point showed much greater error and tended to be 'drawn toward' the first. This may be related to Von Frey's earlier demonstration of an '*Anziehungseffekt*' which was most marked when one point was more strongly stimulated than the other. Von Frey had also shown that this effect decreased as the separation between the points increased. In a well-planned series of experiments, Madlung (65) made it clear that the *phenomenal*, and not the anatomical, separation of the two points was the critical factor. By crossing the

forearms in front of the body and stimulating a point on each arm, he was able to change the phenomenal separation without varying the anatomical, because the '*Anziehungseffekt*' worked across from one arm to the other as well as on the same arm.

More specialized studies have been reported by Dallenbach (17) on the accuracy of localization on the finger tips, and by Schriever and Gehlert (91), who systematically measured errors of localization throughout the mouth cavity. Hoagland (51) and Hoagland and Berkovich (56) suggest a possible neurological basis for localization in the frog, operating through patterns of discharge, in spite of the overlapping of nerve fibers in a given area.

Two-Point Limen. K. Müller (71) compared the two-point limen with fixed and moving stimulation. Moving the stimulator 1 cm. or so reduced the limen to nearly half its previously determined (fixed) value, while even movement of 1 or 2 mm. was sufficient to cause a marked reduction. Müller argued that the result is a dynamic effect of the movement itself. However, there are several other possibilities: With movement, there is greater likelihood of variations in pressure at the two points, or of differences in sensitivity from point to point which might provide the partial equivalent of successive stimulation. Moreover, it is conceivable that repeated stimulation at the same two points, even without movement, might give the subject a better basis for judgment and produce superior results analogous to those of Müller's; this could be subjected to direct experimental check. Mukherjee (69) states that a general improvement in two-point discrimination followed training on specific areas, but presents inadequate statistical evidence in support.

Zigler (103) attempted to compare, under identical stimulus conditions, the successive two-point limen and the error of localization. Ordinarily, the error of localization means the amount of discrepancy between the actual point of stimulation and the locus designated by the subject. Zigler, however, uses the term in a very special sense: with two successive stimulations, the task is to judge whether the second occurred at the 'same' or at a 'different' locus. For the two-point limen, the task is to report whether the stimulation was perceived as 'single' or 'double.' The latter instruction resulted in a limen about two and one-half times as large as the former. Since the stimulus situation was objectively the same for both, this difference must be ascribed to the influence of *Aufgabe* or set. It would seem best to reserve the term 'error of

localization' for its more common meaning. The limen obtained with the 'same-different' instructions, where the criterion is clear unity, might be called the 'one-point' limen, while that obtained with the 'single-double' instructions, where the criterion is clear duality, would then be the 'two-point' limen. The range between the one-point limen and the two-point limen would mark the extent of the transition zone.⁸

Perceptual Phenomena. Roughness and smoothness as surface characteristics were studied by Basler and Schuster (5). With progressively greater separation of projections, on a surface moved over the skin, judgments were found to change from "smooth" to "rough" and finally to "smooth with bumps." It was found that 'roughness' could be synthesized by combining two stimulus conditions which independently gave only 'stickiness' and 'vibration.' Werner and Schiller (100), in one of a series of studies on roughness as an intermodal phenomenon, showed that tactile roughness could be increased by accompanying visual flicker or acoustic tremor.

Rosenwald (85) studied the transition from 'sharp' to 'blunt' by applying stimulators of varying diameter. In the reports there appeared not simply these two extremes, but a series of phenomenal stages which were related to stimulator diameter fairly consistently for each individual. Even above the size which produced the perception of a definite two-dimensional surface, there was a considerable range of areas in which size comparisons were extremely vague.

In the perception of forms pressed against the skin, Martin (67) found the expected variations in accuracy when different parts of the body were utilized. Franz (29, 30, 32) and his co-workers demonstrated that localized training in form perception on one part of the skin brings about general improvement in other parts of the body.

A very extensive study of illusions in the tactile field is reported by Révész (83), who duplicated virtually all of the familiar figures in forms suitable for pressing against the skin. He found, in brief, that all the optical illusions, except those depending upon the peculiar properties of the eye, also hold for tactile and tactile-kinesthetic perception. He concludes that all these illusions are

⁸ A large number of studies have dealt with the effect of different instructions on the two-point threshold and with the possibility of spatial discrimination below that level. Most of this work may be found by reference to Boring, E. G. The stimulus-error. *Amer. J. Psychol.*, 1921, 32, 441-471, esp. pp. 465-470.

expressions of a general form-perceiving tendency which may operate through any form of sensitivity. Studies confined to the problem of filled and unfilled space have also been made by Craig (15) and Yokoyama (101), with results similar to some of those of Révész.

Tastevin (93), treating Aristotle's famous crossed-finger illusion, calls attention to the fact that when almost any movable portion of the body (the limbs, tongue, lips, penis, scrotum, etc.) is stimulated while displaced from its normal position, the resulting experiences are 'returned' or referred back to the normal position. Tastevin's finding that this illusion is at its height when the limit of voluntary movement is reached deserves further study.

Apparent movement on the skin was studied systematically by Neuhaus (74). In general, he discovered that similar laws apply to stroboscopic movement in both vision and touch, but in the latter the stages from succession through movement to simultaneity were not easily distinguished by some individuals, nor as clearly related to the objective stimulating conditions. Apparent movement in the form of spirals and "linear surges," when the skin is diffusely stimulated with a water spray, was investigated by Schaefer (89), who showed that the phenomena could be modified experimentally in a number of ways. He relates these movements to the visual autokinetic illusion and to kinesthetic drift, holding that all are functions of the same fundamental mechanism.

The interrelation of tactile space and time was investigated by Helson and King (49), who demonstrated that when three points were stimulated at unequal temporal intervals it was necessary to change the spatial intervals in the opposite sense to obtain phenomenal equidistance. An equilateral triangle appeared distorted when the three corners were stimulated at unequal time intervals. Another aspect of the space-time relation was studied by Pätzold (76), who compared the estimation of the distance between two points stimulated simultaneously with its estimation when a single stimulator was moved from one point to the other at a uniform rate. With very slow movement, the distance traversed between the points was overestimated, but with very rapid motion it became phenomenally shorter than with simultaneous stimulation.

Mukherji (70) attempted to measure the influence of active and passive attitudes upon the duration of tactile aftereffects, but found the presence or absence of tickling to be the chief determining factor. Studies of tactile imagination and tactile aftereffects

in normal and pathological cases by Bromberg (11) and Bromberg and Schilder (12) show certain recurring features of motility and distortion in the reports.

NEURAL BASIS OF THE SKIN SENSES

The customary assumption that there are four cutaneous modalities (touch, pain, warm, and cold) implies a belief that they have separate receptors and nerve pathways. In this section we are concerned with evidence bearing on this view. We shall confine our discussion to the peripheral factors, since we do not consider it our province to treat the extensive literature on localization of function within the central nervous system, which has become a highly specialized field.

In terms of purely phenomenological descriptions, the number of modes of cutaneous experience might be multiplied almost indefinitely beyond the currently accepted four skin senses, being limited apparently only by the patience and vocabulary of the subjects. Even from a neurological standpoint, moreover, extensions of the list have been proposed. Thus, Head's distinction between protopathic and epicritic sensitivity, which has not received any new support in recent years, demands a greater number. So also would the assumption of a special vibration sense, which now seems a quite needless complication.

On the other hand, proposed reductions of the list have been infrequent. Nafe, it is true, sought to dismiss the problem entirely in his "quantitative theory of feeling" (73) by assuming that all the apparently different modalities could be accounted for in terms of the number, pattern, and temporal spacing of nerve impulses within a single system. However, in his current vascular theory of temperature sensitivity, warm, cold, heat, and certain kinds of pain are ascribed to kinesthetic impulses from the dilation and constriction of blood vessels.⁹ This would leave for explanation by the earlier quantitative theory only those experiences produced by mechanical stimulation, *i.e.* the touch-pain complex, apparently much as it has been conceived by Goldscheider.¹⁰ Although both of Nafe's theories have received considerable notice, they appear to be oversimplifications which do not accord with the experimental facts.

On the experimental side, the pertinent evidence is derived

⁹ For criticism of this theory, see Part I of this review, *op. cit.*, p. 299.

¹⁰ See Part I of this review, *op. cit.*, p. 286.

primarily from a variety of ingenious ways of *dissociating* the total mass of cutaneous experience so that its components may be studied. Specific reference has already been made to such investigations in connection with the touch-pain controversy,¹¹ and this material need not be repeated here.

Nerve Regeneration Studies. The return of sensitivity to transplanted skin, after various kinds of skin grafts, has been investigated by Kredel and Evans (62), Davis (22), and Davis and Kitlowski (21). Although their methods of testing leave much to be desired, there is general agreement on dissociation in the return of sensitivity, indicative of neurologically distinct modalities. A much more precise investigation is that of Lanier, Carney, and Wilson (63). In three individuals cutaneous nerves of the forearm were blocked by alcohol injection, and the extent of original loss and the progress of regeneration were followed by systematic determinations of thresholds, over a period of months. The areas of immediate loss were greatest for warm, somewhat less for cold, and still less for touch and pain. The latter two regions conformed generally, but there was a large triangular region in one instance where sensitivity to pain was lost while that to touch remained at an approximately normal level. Pain, touch, and cold began to return at about the same time and advanced distally at about the same rate; but the return of warm was greatly delayed. Both in the original loss and in regeneration there is clear evidence of the dissociation of touch, pain, warm, and cold.

Electrophysiological Studies. With the development of the cathode-ray oscillograph for recording nerve action-currents, a new technique became available which promised far-reaching results in the cutaneous field and possibly a direct demonstration of the classical Müllerian doctrine of specificity. The nerve was excited at one point and the action-currents recorded from electrodes some distance away. In this way, the action-current record was spread out into a 'spectrum' which was found to be a function of the differing conduction rates of fibers with varying diameters and myelinization.¹²

In the earliest work, it appeared that there were four separable fiber-size groups in cutaneous nerves, each with its own distinct

¹¹ See Part I of this review, *op. cit.*, pp. 285-288.

¹² A summary of much of this work may be found in (34). Bishop, Heinbecker, and O'Leary (9, 44, 45, 46, 47, 48) have been responsible for a large proportion of the attempts to determine the function of various fibers.

characteristics of conduction. This led to high hopes of the possibility of linking these directly to the traditional four modes of experience. More precise determinations, however, showed that no such simple solution was possible. The 'spectrum' was found to be practically continuous, and the apparently discrete groups turned out to be merely peaks caused by concentrations of fibers in certain size ranges. Nevertheless, it is useful to identify three main concentrations. Neglecting certain discrepancies in the terminology used by different workers, these are:

A—Myelinated fibers: diameters, 5μ and larger; conduction rates, 30 m./sec. and faster.

B—Myelinated fibers: diameters, 1 to 5μ ; conduction rates, 5 to 15 m./sec.

C—Unmyelinated fibers: diameters, 1 to 5μ ; conduction rates, 1 to 2 m./sec.

Although B and C fibers have approximately the same diameter range, the lack of myelinization of the C group accounts for its slower conduction rate.

Ideally, even this much differentiation should make possible a correlation between each quality of cutaneous experience and the fiber group or groups responsible. Actually, direct crucial evidence is still lacking. Direct evidence would require comprehensive action-current records from nerves *in situ* in conscious human subjects who could simultaneously report what they were experiencing. No such records have as yet been obtained, although approximations—requiring various amounts of indirection—have been made. Heinbecker, Bishop, and O'Leary (46) have made several suggestive, but not crucial, studies with human beings. Eichler (26), also working on the human level, has recorded action-potentials from the skin surface by stimulating the underlying nerve bundles with single condenser discharges, but this gives only a gross record which is of little aid in the problem. Zotterman (105, 106, 107, 108, 109) has carried out technically excellent work with animal preparations, but by this technique the nature of experience can only be inferred from the type of stimulation employed and the behavior of the animal. For example, by stimulating the surface of the cat's tongue and the skin of the leg, Zotterman obtained clearly different action-current patterns from different types of stimulation, such as warm water, cold water, light contact, and heavy pressure. Completely analogous human phe-

nomena cannot be assumed, but Zotterman's well-conducted studies may forecast what will some day be possible in this field.

Differential Blocking. An allied approach which is subject to the same drawback of indirection is the blocking of nerves by narcotics or pressure. With human beings it is possible to determine by subjective report the order of disappearance and reappearance of the various forms of cutaneous experience when a nerve is temporarily blocked. In animal preparations, similar nerves may be blocked and the effects on the action-current patterns studied in detail. By combining the data from the human and the animal studies, we can then *postulate* the fiber groups responsible for each kind of experience.

This, again, is no simple affair. There are two chief types of blocking agents, operating roughly in opposite ways. The perineural or spinal infusion of a narcotic in the human subject causes the disappearance of cutaneous sensitivity in the order: *cold, warm, pain, and touch*. At least, this is the sequence found by Heinbecker, Bishop, and O'Leary (45) in what seems to be the best controlled study, although some earlier workers claimed that pain disappeared before cold and warm. In any event, sensitivity to mechanical stimulation is the last to go. When the same narcotic is used with animal preparations, the action-current record indicates a progressive loss from smallest to largest fibers. There is considerable overlapping, but plainly the large (A) fibers are the most resistant. By analogy with the human being, this would mean that touch is mediated by the large fibers.

Much less clear are the results when the blocking is produced by pressure. It seems to make little difference whether this is applied to the limb as a whole by a cuff or more directly to the locus of the nerve trunk. In the human subject, the results are not merely the reverse of those obtained with narcosis, as was earlier believed. Pressure and cold disappear almost completely before warm and pain are strongly affected, but further separation within these two groups has not been possible. Likewise, in the action-current records from animal preparations, the B group of fibers and the fastest components of the A group disappear first, then the slower A fibers go, leaving, finally, only the C group, which remains intact after both A and B are completely obliterated. According to Lewis, Pickering, and Rothschild (64), confirmed by Clark, Hughes, and Gasser (13), these complicated effects may be traced to the fact that the pressure does not operate directly, but indirectly by

causing asphyxia of the nerve. In any event, judging from the combined human and animal effects, the hypothesis may be ventured that touch is mediated by relatively large fibers, that warm and pain—to some extent at least—are carried by small fibers possibly in the C group, and that the fibers for cold lie somewhere in between. It will be noted that the sole point of complete agreement between these results and those obtained by narcosis is in the assignment of touch to the large fibers.

Another method of differential blocking has been developed by Thompson and his co-workers (94, 95, 96, 97, 98), who employ a carefully regulated alternating current applied to the region of the cutaneous nerve trunk. This results in a clean-cut blocking out of sensitivity to light contact stimulation throughout the area supplied by the nerve, although it does not differentiate clearly the other modes of experience. The method has been utilized mainly to map the skin areas supplied by different nerve branches.

Histological Evidence. Since the discovery over 50 years ago that sensory 'spots' could be mapped on the skin, repeated attempts have been made to identify histologically the implied receptors corresponding to them. Up to now, these efforts have met with small success. Although there is no doubt that some nonuniform distribution of differentially sensitive end-organs must underlie the complex patterns of sensitivity found on the skin, there is no conclusive evidence regarding their nature. Since it has been shown that any given map of 'spots' is valid only for highly specific conditions of stimulation, there is considerable question of the feasibility of the direct approach of excision and histological study. The same fundamental difficulty applies to the indirect method of comparing the number of spots of various kinds with the number of fibers of different sizes as determined by staining and counting. Ranson has published several articles on this subject (80, 81), with a final summary (82) in which he acknowledges that neither the fiber counts nor our knowledge of the distribution of sensitive spots is sufficiently accurate to permit any correlation.

Further elaborations and descriptions of specialized 'end-organs' from a purely histological point of view are being offered from time to time, but—without knowledge of their function—these add little to our understanding of the problem and need not be detailed here.

The data from these varied sources point to a scheme of four cutaneous modalities: cold, warm, pain, and touch—with separate

receptors and separate peripheral nerve pathways.¹³ When the final neurological picture is drawn, there will be needed more precise information than now seems available on the corresponding spinal and subcortical tracts and the cortical projections. Such a study as that of Marshall, Woolsey, and Bard (66) on cortical representation of touch seems to be in line with the hypothesis we have accepted.

However, a thorough sifting of the evidence obliges us to conclude that the allocation of fiber size-groups to the four modalities involves considerable uncertainty. In summary, it can only be said that:

Touch, or sensitivity to light-contact stimulation, has consistently been placed in the A (large) fiber group. On this point, the studies with narcosis, pressure block, and alternating-current block agree, and Zotterman's work with cat preparations points in the same direction.

Cold, on the basis of pressure block, would seem to occupy an intermediate position, approximately in the larger B fibers; yet its early disappearance under narcosis seems to belie this location.

Warm, from the pressure-block results, seems to remain when only C fibers are functioning; yet it disappears after cold with narcosis, which is not consistent with this assumption.

Pain, likewise, appears to be mediated by C fibers, since it remains to the last with pressure block. Yet Heinbecker, Bishop, and O'Leary seem to have demonstrated clearly that pain is present in narcosis after both warm and cold have gone, thus placing it in either B or A.

To reconcile these discrepancies, it may be necessary to assume that a given modality (particularly pain) may be mediated by more than one range of fiber sizes. Further research, however, may clarify the experimental findings and show that we can avoid such a theoretical complication.

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¹³ Mostly on the basis of clinical data, the suggestion has been made that the autonomic nervous system may have a sensory, as well as a motor, function. At the present time, the evidence is far too contradictory for adequate evaluation by anyone but a specialist in this field.

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EXPERIMENTAL HYPNOTISM: A REVIEW

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The present review, covering the interval from August, 1930, to June, 1939, is limited to 10 problems of experimental hypnotism (not including animal hypnosis or the forensic, therapeutic, and purely theoretical aspects) and deals with only 86 of the 350 or so books and articles published during that time. The last general review, by the writer, appeared in this journal in 1931 (85).

Hull's *Hypnosis and suggestibility* (37),¹ Winn's *Scientific hypnotism* (83),² and Volgyesi's text (73) in German, exemplifying the reflexology treatment, deserve mention.

Speaking generally, mention should be made of Hull's (36) list of 101 items for experimentation; Beck's (5) demonstrational silent film; Raginsky's (61) review of much material on hypnotic anesthesia; Jenness and Wible's (42) evaluation of the work on autonomic functions; and Friedlander and Sarbin's (30) article on measuring hypnotic depth.

DOES HYPNOTIZABILITY CORRELATE WITH OTHER PERSONALITY TRAITS?

Friedlander and Sarbin (30) report: "It can still be said that no positive relations between hypnotic test scores and any measurable personality trait have yet been established," *i.e.* none with intelligence, extroversion, ascendance, neuroticism, nor affectivity, even though hypnotizability may correlate with amiability, as tested by Laird's "traits which make us liked." Davis and Husband (14) could not verify Janet's or Freud's theory connecting susceptibility to hypnosis with neuroticism or affectivity, respectively. Beck (4) concludes that personality tests (such as the Bell Inventory) shed little light upon hypnotizability.

Barry, MacKinnon, and Murray (1) failed to substantiate the supposed relationships between hypnotizability on the one hand and auditory thresholds,³ submission, and extroversion on the

¹ Reviewed in *Psychol. Bull.*, 1934, **31**, 211-215.

² Reviewed in *Psychol. Bull.*, 1939, **36**, 708-709.

³ Jenness and Dahms (40) agree with Barry, *et al.* on this point.

other. Wells (75), on the contrary, found a correlation of $.25 \pm .209$ (for men) and $.78 \pm .098$ (for women) between *noncompliance* and hypnotizability, and a low positive correlation between ascendance (Allport) and hypnotizability. R. W. White (78), judging by the subject's attitude toward hypnosis as revealed in his own stories about hypnosis told during an imagination test, concludes that response to hypnosis "bears a definite relation to the subject's general social attitudes and to his particular attitude toward hypnosis. The attitude with which a subject faces the hypnotic situation goes far to determine the outcome."

DOES HYPNOTIZABILITY CORRELATE WITH SUGGESTIBILITY?

Barry, MacKinnon, and Murray (1), using Hull's swaying test and a group suggestibility test, conclude that "suggestibility under hypnotic conditions does not correlate with suggestibility under other conditions, that is, when subjects assume their customary attitudes." Williams's extensive experiments (82) led him to the same conclusion. Just to the contrary, Beck (4) states that waking tests of suggestibility (Chevreul's pendulum, electric shock, hand steadiness, etc.) may predict hypnotizability with considerable accuracy, the results agreeing with those of Saltzman (64). These contradictory experimental results keep cropping out: Dorcus (17), Jenness and Wible (42), Krueger (44), and R. W. White (78) found hypnotizability correlated with suggestibility; whereas Davis and Husband (14), W. R. Wells (75), and P. C. Young (unpublished work) found either no correlation or a negative correlation. Biermann (8) says: "In very deep hypnosis there may be a lessening, sometimes a lack, of suggestibility." Caster and Baker (13) report that 2 of their 10 subjects showed negative suggestibility in the trance!

IS HYPNOSIS A DISSOCIATED STATE?

The concept of dissociation, as well as that of suggestion, has been beset with serious questioning. Mishchenko (51) reports that conditioned responses are more easily formed in hypnosis than in waking and that there is no difference between the two states in making discriminations and in forming conditioned inhibitions. Scott (66) found that defense movements of fingers were more easily set up in hypnosis than in waking. Dorcus (17) even says that "all the experiments [his own] point to a high degree of integration during hypnosis." Although Pattie (55) speaks in terms

of the "conative" nature of dissociation, still he describes a very fine type of integrative behavior during repeated hypnosis, with such clever malingering that the subject deceived the experimenter during several months of experiments—"She lied and stuck to it."

Barry, *et al.* (1) report negative results between hypnotizability and other possible manifestations of dissociation; while Carlill (12) has failed to hypnotize "a number of natural sleepwalkers."

Finally, Beck (3) asserts that hypnotic subjects participate and discriminate selectively to the point of trickery in order to foster a wish, stating further that "most hypnotic S's manifest a high degree of volitional activity in carrying out suggestions," *i.e.* in accordance with their own ideas. Many experimenters still talk of dissociation,⁴ but the term must be stretched greatly to make it "conative" in nature, as Pattie (55) and Lundholm (48) aver, and synonymous with malingering or trickery (Pattie), rather than automatism.

IS HYPNOSIS A WAKING STATE?

Experimental results positively correlating hypnosis with waking are so numerous that only a few can be mentioned: those on brain potentials by Blake and Gerard (9), as well as by Loomis, Harvey, and Hobart (47) and Bier (7); on respiration and heart beat by Jenness and Wible (42); on patellar reflex by Bass (2); on breathing and oxygen consumption by Fulde (31); on cerebral circulation by Nygard (54); on blood pressure, blood count, and chemical analysis of the blood by Goldwyn (33); on mental activity by Goldwyn (33) and Beck (3); on mental integration and volitional activity by Dorcus (17) and Pattie (55). Contrariwise, the reflexologists find hypnosis sleep-like in latent time and reflex action (Mishchenko, 51) and in general cortical inhibition (Biermann, 8). Stalnaker and Riddle (71) show that though there was a gain of 38.5% (median) in hypnosis over waking performance in remembering one-year-old material, still 5 of the 12 subjects were better in waking. Do these contradictions point to different kinds of hypnosis?⁵

ARE THERE DIFFERENT TYPES OF HYPNOSIS?

Recognition of different types of hypnosis (as well as classification of persons into types that can or cannot be hypnotized) goes

⁴ *E.g.* William Brown (11) thinks dissociation the fundamental characteristic of hypnosis.

⁵ Jenness (39) raises the question whether different hypnotic procedures induce different types of hypnosis.

far back. In 1925 (84) the present reviewer divided subjects into "alert" and "lethargic" groups, conformable with the concepts of Trömmner, Binet, Moll, Bernheim, and other still earlier workers. Lately, R. W. White (79) has called the contrasting types *active* and *passive*; Davis and Kantor (15) speak of *active* and *lethargic*, the former giving psychogalvanic reactions much like waking, and the latter, sleep-like responses. A late classification of Mishchenko (50) describes the excitable type of nervous system as going into somnambulism, the balanced type as only lightly hypnotizable, and the inhibitive type as mostly unhypnotizable. According to R. W. White (79), the active type shows no delay in making movements in hypnosis, *enjoys* submission, and is clinically judged to be deferential and affiliative in behavior; whereas the passive type resists disturbance to his repose and is clinically judged high in habitual anxiety in stressful situations. To the suggestion, "You can't raise your arm," the active type responds with great effort; the passive type does not even try. The reviewer would add to this description that the active type in hypnosis is characteristically *en voyage*, reporting clear-cut dreams; the passive subject lies inert, with mind apparently blank.

The need is paramount for the acceptance of some such standard technique of inducing hypnosis and measuring its depth as that put forth by Friedlander and Sarbin (30). With this technique⁶ the actual words to be used and the challenges to be made are read out in a definite order. The procedure consumes, at most, 14 minutes. From testing out the procedure on 83 subjects, the experimenters claim a correlation of $+.80$ for test-retest. Although Friedlander and Sarbin do not agree with R. W. White in differentiating between an active and a passive class of hypnotic subjects, close adherence to their technique might make it possible to test whether persons hypnotized with the same technique would go into different types (not stages) of hypnosis.

HYPNOTIC REGRESSION—FACT OR ARTIFACT?

In spite of the extensive writings, on meager experimental bases, of Platonow (58), Gauger (32), and Hakebush, *et al.* (35),⁷ there is no report of a rigorously done research favorable to hypnotic age-regression.⁸ Dolin (16) shows that by hypnotic sug-

⁶ An extension of the work of M. M. White (76); Davis and Husband (14); Barry, MacKinnon, and Murray (1); and others.

⁷ Some of the Russians claim to have induced behavior fully characteristic of the neonate as well as of any other aged child, as tested by intelligence tests.

⁸ The reviewer has criticized these researches elsewhere (86).

gestion of age-regression a "profile of development" becomes manifest rather than "a mechanical stratification of vital situations, when each of them gets encapsulated in the chronological order of events and does not undergo any changes, transformations or corrections under the influence of subsequent experience of the developing personality."

HYPNOSIS AS AN EXPERIMENTAL PROCEDURE

Following Luria's early lead (49) first Huston, Shakow, and Erickson (38), then Erickson (21), Brickner and Kubie (10), and Eisenbud (20) have modified the Luria technique for inducing experimental conflicts by implanting a complex in hypnosis. Naturally, this procedure has great therapeutic possibilities.

Sarbin (65) found that the Rorschach test was greatly affected by hypnotic suggestion, *e.g.* suggesting that the subject was M. Curie resulted in a predominance of French associations. Erickson (25) has shown in detail how hypnosis may be used to demonstrate the psychopathology of everyday life: *lapsus linguae*, ambivalence, rationalization, automatic writing, and implantation of a complex. Fisher and Marrow (28) studied free association times during hypnotically induced moods. Rowland (62) tried to get a pure culture of somatic effects from exciting stimuli by means of hypnosis. Inducing light hypnosis by hyperventilation (*i.e.* overbreathing) is described by Seeligmüller (68). That hypnosis may be an effective way of inducing Jacobsonian relaxation is reported by J. H. Taylor (72). Dream study in hypnosis has been carried forward by Welch (74) and by Siebert (70). M. M. White (77) partially verified the Freudian theory of repression in that he found a longer reaction time to unpleasant words than to pleasant words in hypnosis.

IS HYPNOSIS DANGEROUS?

Though Erickson (24) confirms what has become the scientific tradition—namely, that hypnosis is innocuous—by finding that repeated induction of hypnosis does not result in hypersuggestibility, alteration of the personality, falsification of reality, or the elaboration of escape mechanisms, yet his experiments and observations, like all others with similar results, seem outmoded by Rowland's (63) use of invisible glass and ingenious "cages." This gave to the experiment every appearance of reality and yet protected the otherwise hapless victims, the subjects themselves and

others, from a live rattlesnake and from sulphuric acid, respectively—with the result that the possible dangers in hypnotic situations were dramatically demonstrated. The actual situation was seemingly falsified through trustfulness and obedience to the operator.

UNUSUAL ORGAN CHANGES

Some of the reported results of hypnotic suggestion are so startling that one wonders whether proper controls were observed. Take, for example, Benedek's (6) accelerating of the pulse and producing hydrosis of the face; Platonow and Matskevich's (59) causing acute alcoholic intoxication to disappear or preventing its appearance if enough alcohol to intoxicate is drunk as "water"; Povorinskij and Finne's (60) increasing blood sugar by suggesting that honey has been ingested or lessening the effect of actually ingested sugar; Shliffer's (69) counteracting the effect of the injection of 1 cc. of 1% adrenalin. However, some experimenters have had very different results; for example, Grassheim and Wittkower (34), with 20 subjects, could not by suggestion alone either induce or eliminate the effects normally connected with the ingestion of proteins. Moreover, Levine's (46) subjects registered characteristic somatic responses in spite of hypnotically suggested anesthesia.

Jenness and Hackman (41) attribute a 40% reduction of salivation in hypnosis to the relaxation induced. Lauber and Pannhorst (45) verified strong effects on heart and circulation of hypnotic emotional suggestion even when all peripheral activity was controlled. Kharmandar'ian, Platonow, and Bezchinskaiâ's (43) results agree with those just mentioned. According to Frick, Scantlebury, and Patterson (29), "these [their own] preliminary studies show that the process normally controlled by the autonomic nervous system may be influenced directly by suggestion" (*i.e.* by hypnotic, but not by waking, suggestion).

HYPNOGENIC MECHANISMS

Are the causes of these profound organic changes in hypnosis attitudinal or aptitudinal, conative or cognitional, volitional or reflexive? Hypnogenic factors may be diagnosed better, perhaps, from experiments on simple sensory experience than from those on the more spectacular, but more complicated, autonomic processes. In spite of contradictions, the weight of testimony seems to

point to an actual change in the content of sensed stimulations as the result of hypnotic suggestion, rather than merely to a changed attitude towards the stimulations sensed. We shall take the contradictory results first. Pattie (56), as a result of testing hypnotic anesthesia by an ingenious use of the "Japanese illusion," contends that the anesthesia was not genuine in the sense that organic anesthesia is; and from another research (55) he concludes that hypnotically induced blindness is a refined type of malingering. Lundholm (48) and Dorcus (17), on the basis of their experiments on various types of sensory experiences, have expressed similar conclusions.

In strong contrast with these conclusions are those of several workers. Dynes (19), by means of hypnotic suggestion of anesthesia, practically abolished respiratory and cardiac changes which normally occur after a pistol shot or painful cutaneous stimuli. Erickson (23) speaks of "psychological and neurophysiological changes (induced by hypnosis) comparable in degree and character with those arising from organic deafness." Sears (67), using various apparatus, found that "voluntary inhibition of reaction to pain does not present a picture even remotely resembling the reaction under true hypnotic anesthesia." Doupe, *et al.* (18) report that the stimulation of a limb in which analgesia had been suggested in hypnosis brought about significantly less vasoconstriction than was evoked by similar stimulation of the normal limb.

In vision, too, hypnotic suggestion not only disposed the subject to see or not to see something, but, as Erickson (26) declares, brought on deficiencies comparable with those of actual color-blindness; and Erickson and Erickson (27) state that, when the white sheet upon which a color had been hallucinated was withdrawn, the psychophysical activity stopped and initiated the readjustive activities. Dorcus's subjects (17), however, failed to produce the kind of after-images and other visual reactions suggested, responding, instead, with the actual images. Of all those engaged in this type of research Loomis, Harvey, and Hobart (47) report the most convincing case in their study of brain potentials. Fastening open the hypnotic subject's eyes with adhesive tape, they suggested to him every alternate 15 seconds that he could see and that he was blind. This was done many times. "In every case trains appeared when the suggestion was made that he was *blind*, and in every case they ceased when the suggestion was made that he could see. This was true both when there was a

light in the room and when the room was in total darkness." These experimenters have never been able to start "trains" by suggestion to nonhypnotized subjects, with eyes open in a lighted room, that they could see nothing.⁹

In the face of such experiments as those of the Ericksons and of Loomis, *et al.*, some current explanations as to how organic effects are produced in hypnosis seem very inadequate, *e.g.* Pattie's (55) that the suggestion (of blindness) sets up a conflict between two sets of tendencies: (1) the tendency to believe he is blind and to act upon that belief, and (2) the tendency to know that he can see and to malingering (subconsciously); or Lundholm's explanation (48) that the suggestion of anesthesia builds up a tendency to act as if anesthesia exists, eventuating in a conscious inhibition of habitual responses and an apparent (not real) anesthesia; or Dorcus's idea (17) that the responses "agree with the S's ideas as to what E expects." After all, these explanations amount to saying that the subject is playing a game with the experimenter and with himself. They would put the inhibition or dissociation (if dissociation is admitted) at a very high integrative level. This affectional or conational hypothesis is in strong contrast with what might be called the cognitional hypothesis or, simpler still, the conditioned response theory. As Grassheim (34) puts it: "Independent of affective moments it is possible to bring about a conditioned alteration of organic functioning through the fiction of an organic demand." Thus, the idea brings about the actuality in line with John Hunter's saying (81) of long ago: "I am confident that I can fix my attention to any part until I have a sensation in that part." Platonow (57) is still more explicit in stating: "The word is a naturally conditioned stimulus and therefore acts as a real stimulus (Pavlov). The awakened conditioned reflex is the copy of an organic inherited unconditioned reflex Suggestion is a typical simple conditioned reflex (Pavlov) and word-suggestion appears as an exclusively physiological process. There is apparently no function which under certain circumstances cannot be facilitated, inhibited, or changed into its opposite simply by means of verbal

⁹ This would seem more marvelous if Blake and Gerard (9) had not subsequently shown that the suggestion of light (to a normal waking subject), "via auditory channels, can disrupt the regular beat of cells in the visual cortex Presumably indirect connections from the frontal lobes, under conditions of 'visual attention,' can exert the same control over the occipital neurones as can the fibres of the geniculate body."

suggestion."¹⁰ Following out this idea, Platonow assigns hypnosis a causal and not merely a symptomatic value in medicine.

CONCLUSION

The oftentimes contradictory results of recent hypnotic experimentation seem to throw doubt upon the utility of the concepts of suggestion and of dissociation and upon the too easy assumption that hypnosis is a type of waking reaction depending upon coöperation. Hypnosis emerges from its recent oversimplification as a very complex—not to say enigmatic—reaction pattern, differing perhaps not only in individuals, but also in types of individuals. Furthermore, it may possibly differ according to the methods employed in inducing it, the criteria used in selecting subjects, and the expectation of the subjects. It seems a much more powerful reaction, much more potentially dangerous, and much more useful experimentally and therapeutically than was thought 10 years ago. Finally, the refined techniques that have uncovered these complexities may be useful in analyzing out some of the hypnogenic factors. To the reviewer, the conditioned reflex theory seems to have more promise etiologically than do theories of suggestion or dissociation—even though we may seem thus to have gone back to the old ideomotor hypothesis.

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¹⁰ Johannes Müller (81) said: "The idea of a particular reaction determines a current of nervous action towards the necessary muscles and gives rise to the motion independently."

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BOOK REVIEWS

WARDEN, C. J., JENKINS, T. N., & WARNER, L. H. *Comparative psychology: a comprehensive treatise*. Vol. II: Plants and invertebrates. New York: Ronald Press, 1940. Pp. xiii + 1070.

Volume II of the general work, *Comparative psychology*, is a splendid résumé of the evidence bearing directly and indirectly on behavior in the invertebrate phyla, approaching encyclopedic proportions in its bulk of information although confined to 807 pages of text. In a general way the treatise resembles works such as Kafka's "Einführung . . .," the "Tierpsychologie" of Hempelmann, and the comparative physiologies of Jordan and of Von Buddenbrock, in that its chapters are phylogenetically ordered and its fundamental organization of evidence has a sensory-motor basis. But it differs from previous handbooks particularly in the completeness with which a universal array of evidence is marshaled, in its meticulous scholarship, and in a reportorial thoroughness which involves a minimum of special interpretive digression. The value of this treatise as a basic reference work is greatly enhanced by the clear and economical literary style which is used throughout.

This volume is mainly the work of Dr. Jenkins, with the exception of the chapter on plants, which was prepared by Dr. Warden. The proportions of this section of the series are suggested by the fact that the bibliography totals 4867 items (much closer to 5000 if subnumbered citations are included), whereas Volume III, on vertebrates, has 2030 bibliographical items.

Through its wealth of organized information this treatise should assist greatly in stimulating further interest in inframammalian forms on the part of American animal psychologists. Of course, it is an impressive fact that in the past few decades the unique contributions which American workers have made to psychological theory in general have been due in no small part to a focusing of interest upon mammalian problems and upon highly specialized techniques for mammalian study. But comparative psychology would seem to have reached a condition of resourceful maturity in which it is capable of also claiming extracephalic sections of the phyletic organism as its own. The volume under review represents a helpful contribution toward such a further growth of the field.

The chapters of this book are arranged in an evolutionary progression. Successive chapters deal with the following topics: I. "Protista, Isolated Cells and Tissue Cultures" (176 pp.); II. "Metaphyta" (107 pp.); III. "Porifera and Coelenterata" (88 pp.); IV. "Echinodermata" (65 pp.); V. "Platyhelminthes, Nemathelminthes, Trochelminthes, and Annulata" (101 pp.); VI. "Mollusca" (65 pp.); and VII. "Arthropoda" (230 pp.). The division of space in general corresponds rather closely to the volume of evidence on the respective animal groups as indicated roughly by the number of items in the bibliography. Thus, the longest chapters are those

on Arthropoda and Protista, which have 946 and 2206 references, respectively; the shortest chapter, dealing with Mollusca, has 275 references. Within the chapters, contrasts in the allocation of space, such as that between the 18 pages devoted to electrical and magnetic reception in Protista and the 13 pages for social behavior in arthropods, may surprise some readers. But such features appear to express differences in the amount of available evidence rather than any bias of the authors'. With the possible exception of "physiological gradients" no topic is slighted, and certainly no topics are overlooked.

The bibliography constitutes a highly valuable section of this book. It is truly a gigantic problem to work out a comprehensive account of evidence from diversified and scattered journal references ranging from zoological to botanical and pharmacological sources, and the task has been thoroughly done. (Thus far, we note, psychologists have furnished a very small part of the evidence on invertebrate behavior.) Practically nothing has escaped the dragnet, with the quite understandable exception that the coverage lapses somewhat for the period just preceding publication. Textual references to literature are given in terms of serial numbers, surely the most efficient practice for a work of this kind (although some readers may object to a separate alphabetized listing and new number series for each of the chapters). As an instance of its convenience, on the highly complicated subject of local stimulation in arthropods some 180 titles are presented in a half page of text containing numbers alone! The bibliography is also remarkable for its accuracy of notation. (But why was it considered necessary to follow the practice of shortening page numbers thus: "385-91," "783-7"?)

There is an author index of 27 pages and a subject index of 19 pages, the latter perhaps too condensed and limited in detail for a work of this comprehensive nature.

The organization of each chapter follows the general schema adopted for the volume on vertebrates. Each of the chapters contains two principal sections. The first section covers *receptive capacities*, with subsections on "chemo-," "thermo-," "contact-," "phono-," "photo-," "electrical and magnetic," "stato-," and "internal" reception. The second section of each chapter covers *reactive capacities*, with typical subsections on "motor equipment," "locomotion," "speed of movement," "coördination," "nutritional behavior," "protective behavior," "reproductive behavior," "inactive states," "sound production," "group behavior," "orienting behavior," "motivation factors," and "modifiability of behavior." As examples of secondary readjustments in this pattern to adapt it to the details of subject matter in given groups, in the chapter on Protista each subsection on Receptivity terminates with a report on theories of the given capacity, and Chapter VII is appropriately modified to accommodate special literature on discrimination and on social behavior in arthropods.

The informative value of the book is greatly increased by a judiciously chosen and clearly reproduced series of 168 figures. Great care is evident in the selection of significant experiments for more detailed discussion and in the presentation of tabular material and special summary schemes.

One criticism may be anticipated—that there is no development of a theory for each animal type and no progressive construction of a theory which embraces all invertebrate types. Although the plan of the series was to supply the broad theorizing in Volume I (*Principles and methods*), the reviewer does not find that Volume I has furnished theory for Volume II, nor does he think this could have been accomplished extraterritorially. Even within the frame of Volume II itself, it seems doubtful that the task of theorizing could have been attacked effectively. The seriatim reporting of evidence under the dominance of a pre-established set of rubrics does not facilitate appropriately dealing with the problem of organization and interrelationship of capacities in particular animal groups. But such a book plan *does* promote the presentation of evidence so that the reader has the maximal fund at his disposal on each special topic and can learn quickly how to find new topics efficiently. That goal the reviewer considers to have been the main interest of the authors, and it has been reached with eminent success.

But theory *is* present in the book—introduced deductively rather than being worked up through the evidence. This condition may be attributed to the channelizing effect of a stereotyped chapter organization, to the limitations of space, and to the dominant responsibility of reporting evidence. The implicit theoretical viewpoint gives rise to occasional assertions which terminate sections and which are offered positively, although without a logical demonstration. Thus we read on page 143, at the end of a section on protistan reactive capacities, that "certain writers" have made "the unwarranted assumption that metabolic gradients are causal determinants of behavior patterns." In the reviewer's estimation, it was ill-advised to offer in that cryptic manner a statement as fundamental as this one, bearing upon the validity of a theory which is widely found of great usefulness in dealing with the problem of animal organization. In the absence of a theoretical critique of the situation and a logical development of the author's own views in terms of the evidence, the statement should have been dropped.

This difficulty with particularized theory accounts for much confusion in reporting evidence on one crucially important question. All would have been well if the authors had consistently followed the procedure, outlined on page 81, of limiting the use of conceptual terms to "specific types of explicit response, i.e., to what is *actually* observed." This commendable objective approach is followed throughout most of the book. But in reporting evidence on the question of "modifiability" in the lower invertebrate phyla, the term "learning" is used in such a way that special perplexities arise at the ends of Chapters I, III, and IV.

Near the end of Chapter I it is said that "further investigation is needed to determine whether the observed change in behavior (i.e., improved capillary-tube reversals in *Paramecium*) is the result of learning, sensory adaptation, or the passive consequences of increased flexibility. *It is likely that all three are involved in the process*" (p. 177; italics mine). One would gather that the three factors mentioned could be clearly distinguished from the evidence or from interpretations offered, but that is not the case. Actually, "learning" is an hypothesized process here, and

only the other two factors conform to the stated platform of objectivity.

On the same point, near the end of the chapter on coelenterates (Chap. III), it is questionable whether the allegedly retained "tidal rhythms" of Bohn deserve much emphasis when they "have not been confirmed by American investigators" (p. 373). Actually, more than three experimenters have had this experience. Thus, it would seem doubtful whether the next-mentioned observations of Van der Ghinst on a rather different kind of activity "substantiate" Bohn's contention that "actinians possess associative memory." And it is highly doubtful whether "further evidence in support of learning capacity in actinians was furnished by Fleure and Walton," since it is admitted on the following page (p. 374) that their report needs confirmation, and particularly since on page 372 a long paragraph of evidence on significantly similar behavior (in polyp feeding) emphasizes the dominance of "negative adaptation . . . due to a loss of irritability . . . on the part of the stimulated tentacles."

To pursue the same question, in Chapter IV the author favors starfish "learning" in a similar manner. In the last paragraph (p. 439), the formidable objection of Moore to the alleged "learning" of altered righting in that animal is dismissed by the statement: "However, as Mast . . . suggests, it would seem that such an experienced investigator as Jennings would find it possible to stimulate the tube-feet without injuring them." As a final statement in a chapter, at a theoretically critical point in the book, this sounds like proselytizing. The reviewer feels that more of the general emphasis upon parsimony should have been applied to these discussions of modifiability. (Of course, his own reaction is influenced by the position of Maier and Schneirla that a real qualitative distinction can be made between the basis for modifiability in organisms below worms and that in higher invertebrates.)

But these specialized matters are of secondary importance in comparison with the fact that this book will provide an invaluable reference source for advanced students in animal, physiological, and child psychology, and in biology.

With the publication of this treatise, which is the last of three volumes in the series, *Comparative psychology*, prepared by Warden, Jenkins, and Warner, the authors have completed an exacting task of scholarship requiring more than ten years of time. The authors can anticipate the unreserved gratitude of countless scientists who will find this set of books an indispensable aid to their work. The reviewer wishes to extend congratulations not only because these volumes are a fine scientific tool and a monumental contribution to the field, but particularly because such a consistent and devoted application of their high capacities reveals an unbounded confidence in the future of the science.

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WERNER, H. *Comparative psychology of mental development.* (Trans. by E. B. Garside, with a Foreword by Gordon W. Allport.) New York: Harper, 1940. Pp. xii + 510.

This book is singularly faithful to its title. It posits a hierarchization

of mental activities and discusses with respect to genetic level the characteristics of primitivity and advanced development in perception, imagery, conception, thought, action, and personality. Primitive organization with respect to each of these categories is said to be *syncretic, diffuse, indefinite, rigid, and labile*. In contrast, organization at genetically higher levels is *discrete, articulated, definite, flexible, and stable*. "... perceived things of the primitive world are constructed differently from the things of advanced, civilized man. Things do not stand out there, discrete and fixed in meaning with respect to the cognitive subject."

In the primitive world, objects are things of action, signal-things, not "discrete and fixed in meaning." For a robber wasp the head of a nail driven into the wall, or any other fly-like object, possesses the "signal properties" of objects of prey. To a child some straw may have the significance of "doll"; some wood, the significance of "horse." The child's things are not discrete, fixed in meaning, but something to be reacted to. (One who subscribes to the motor theory of meaning may regard this dichotomy as an unfortunate one. Even so, this does not alter the facts with respect to the syncretic character of the child's perception.) Similarly, the world of primitive man is chiefly one of signal things, things of action. In pathological "primitivation" instances of the same phenomenon are cited.

Primitive perception is dynamic, physiognomic (alive, expressive, as the human physiognomy) as opposed to the "geometrical-technical" perception of cultured man. This manner of perceiving is also common to children and the pathologically primitive. Evidence is drawn, for example, from children's diaries: a certain geometric figure looked "cruel"; the number 5, "mean"; and the number 4, "soft." The anthropomorphic and animistic concepts of primitive people are secondary to the dynamic, physiognomic character of their perception. Among the schizophrenics, notably, "one often finds a decline in the polarity of object and subject, by virtue of which objects are no longer evaluated in their pure objectivity, but . . . in terms of the affective drives of the person."

Diffuseness—lack of articulation and "domination of qualities-of-the-whole"—is another primary quality of primitive organization. For Volkelt's spider—which was observed to attack a fly caught in the outer meshes of the web but to retreat if by chance a fly entered the nest proper—a fly is not a "detached, self-subsistent thing . . . it is an intrinsic part of the whole situation." Primitive perception is inflexible in the sense that a change in the circumstances surrounding the object alters its signal qualities and therefore the response; an essential condition to a constant object is that the elements comprising it be "experienced in sharp contradistinction to the variable elements. . . . A frog . . . might well starve to death if the fly before it remains motionless." Primitive organization is also unstable: inedible objects may (for a toad) acquire the signal qualities of edible ones, if presented under certain circumstances. These same qualities—diffuseness, inflexibility, and instability—are said to characterize the genetic level of primitive man and certain stages of development in the child, as evidenced by their drawings and reactions to various situations.

Numerous instances of syncretic and diffuse organization are to be found in the mental imagery of children and primitive man—an illustration of which fact is the prevalence of eidetic imagery. The latter is a “relatively normal constituent of the child’s mentality.” Susceptibility to the compulsion of visions, amazing sensuous memory, and naturalistic art suggest that the phenomenon is more prevalent in the mentality of primitive man than in that of a man of advanced culture.

Primitive notions of space are compared in the child and in primitive man. Primitive space (and time) is not “objective, measurable, and abstract in character. It exhibits egocentric or anthropomorphic characteristics, and is . . . rooted in the concrete and substantial.” In pathological primitivation the cases, regardless of the aetiology of the disturbance, exhibit a “relapse to a conception of space intimately linked with the ego and the body. . . .”

In action, primitivity is typified by immediacy, limited motivation, and lack of planning. Primitive action is diffuse, global; it is also rigid in the sense that it is unvarying, repetitious. “One part of the whole event follows its predecessor as a matter of necessity, for none of the parts has in itself any kind of independence.” For example, aborigines are “unable” to begin a song at any point in the text, but always have to commence anew, or “cannot” start a new one until the last verse of the one traditionally preceding it has been finished. (Perhaps Sumner’s statement that “it is difficult to exhaust the custom and small ceremonial usages of savage people” offers a better explanation.) This “all-or-none” quality of behavior is said to be especially common among feeble-minded children and certain psychotics.

The thought of primitive man (and of the child and pathologically primitive)—his theorizing and explaining in terms of cause and effect—is concrete, syncretic, is close to the immediate perceptual level. In contrast, Western thought is universal, abstract, general; the particular is subordinated under the general. Primitive thought is diffuse, global; only slightly does it subordinate the less essential to the dominant. Causal explanations are personal, egomorphic: it gets dark “because the people get tired and want to sleep.” The book treats in a similar manner conception, ideas of magic, and spheres of reality.

Primitive man’s ideas of personality (self) are compared with the child’s, and both with those of Western man. For example, for the primitive man and the child there is less differentiation between motive and deed than for Western man; less differentiation between the mental and physical: the South Sea Islanders and others believe that evil traits can be absolved by washing the body. There is less differentiation from the standpoint of individuation: a Solomon Islander became sick when his wife fell ill and did not cease complaining until she recovered. Everything pleases a child that makes his mother smile. It may be said, however, that, inasmuch as tribal custom and ceremonial had their origins in remote antiquity, there is some question of the legitimacy of making inferences from them about the tribesman’s conceptions of things. Also there are other, and perhaps more plausible, explanations of the child’s being pleased or made ill at ease by his mother’s moods.

A rather lengthy introductory chapter (55 pp.) treats the question of methodology. The advantages of the organic as opposed to the mechanistic approach are presented. "A genuine continuity . . . can be arrived at only by avoiding any definition of the cultural form as the sum of the cultural elements. There must be a uniform cultural gestalt from which the concrete objective expressions of the culture draw their meaning." Thus the blessings of gestalt are extended to cultural anthropology, from which tie-up the former probably stands to derive as much benefit as the latter. Cultural anthropology draws the same commiseration for its atomistic sins as does traditional psychology. Incidentally, it is just possible that this is another instance of limited individuation. The remainder of the book is relatively neutral systematically, although, to be sure, gestalt terminology is used.

The reviewer is impressed with the quality and general high tone of the book. The reader will admire the clarity of style and respect the cogency of the ideas even if he disagrees with many of them. The author has made a contribution to the understanding of mental development quite aside from the comparative aspects.

The description and characterization of primitive mentality, although based on illustrations rather than normative data, are stimulating. It now appears to be pretty generally accepted that the low level of culture fostered by savages and preliterate people does not constitute *ipso facto* evidence of biological inferiority. Moreover, certain ethnopsychologists seem to have reasoned that, since these people are quite successful in adapting to *their* environment, the quality of their mentality is not inferior to that of our own. As over against reasoning of the latter sort, the book brings out many striking differences and as such makes an important contribution to ethnopsychology.

Perhaps the weakest aspect of the entire presentation is the heavy reliance upon illustration—which, after all, illustrates but does not substantiate. One could probably find illustrations to "support" the assumption that primitive organization is discrete, articulate, definite, flexible, and stable rather than syncretic, diffuse, indefinite, rigid, and labile. For example, McDougall was never sorely taxed to find illustrations of flexibility in animal behavior. The author has presented clearly and forcefully some inviting hypotheses. We now require proof, or at least further proof, of generality. We wish to know whether or not syncretism, diffuseness, rigidity, and the like are typical of certain genetic levels, not merely to be found there.

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BIRD, C. Social psychology. New York: Appleton-Century, 1940. Pp. xiii + 564.

Textbooks in social psychology vary widely in scope of topics and in method of presentation. Because the field of investigation is so broad, and because scientific interest has centered on certain topics to the exclusion of others, it is not surprising to find that textbooks in social psychology have placed emphasis on different subject matter according to the

personal interests or the fields of research engaged in by the authors. Likewise, marked differences in method of presentation of material have occurred in textbooks in this field. In some instances, the texts are written from a theoretical, "armchair" point of view, with only occasional reference to experimental studies. At the opposite extreme is the type of textbook that lists experiment after experiment, many of which are repetitious. At the same time, little or no attempt is made to interpret the findings of these experiments or to generalize from them.

Bird, in the preface to his book, has stated specifically the approach he has taken throughout the text. His primary aim was to "relate a large number of experimental studies to a wide range of social problems." Of secondary importance, he has attempted to "reveal the fundamental behavior processes underlying social adjustments." To fulfill these two aims, Bird maintains that he has not assembled researches for the purpose of summary, but to "clarify, and if possible show the solutions for, social problems through the medium of research." Thus, any research study referred to in the text has been included because it contributes to the understanding of human social behavior and not just because it happens to be an experimental study in the field of social psychology.

This point of view toward the use of scientific research in a textbook is most commendable. Too often the student is confronted with a series of experimental studies, summarized in greater or less detail, but with little emphasis on their relationship to the material presented by the author, or without specific attempts by the author to relate the studies to the general theme of the text. The result is that the student is confused by the mass of data presented and, in turn, loses track of the main points as they are given. Instead of emphasizing the material of the text, this is apt to lead to a state of confusion on the part of the reader, resulting in a weakening, rather than a strengthening, of the presentation.

In selecting material for this text, Bird has wisely emphasized topics which have been subjected to extensive scientific investigation. Because the amount of material available is so great that it would be impossible to cover the entire scope in one textbook, except in a superficial manner, the author has emphasized topics which are of major interest to students. He has given only limited attention to topics which have been neglected by research investigators and have received attention mostly from "armchair speculators." True, in social psychology it is more difficult to introduce well-controlled conditions demanded for good scientific research than in many other fields, but marked advances are taking place in improving the techniques used. Bird has sifted out the best of the studies to incorporate in his text.

Before giving a detailed criticism of the book, chapter by chapter, a few general observations about it will be made. The style used by the author is readable and simple, without at the same time being unscientific. This is especially helpful to students who find that dealing with scientific material is difficult enough without its being complicated by the use of words of so technical a type that the translation of these words into everyday language distracts their attention from the subject matter of the book. The use of summaries at the end of the chapters, even though these

are often shorter than one would like to have them, helps to tie together in a condensed form the main points stressed by the author. To help the student grasp the essentials, this is invaluable. The extensive bibliographies given with each chapter serve as a guide for those who are interested in going further into the subject. They also provide the basis for individual research along lines suggested in the text.

Lack of emphasis on subheadings and side headings, as a result of the type used in printing, serves to give the book a more formidable appearance than is justified. Because of the amount of material given in each chapter, it would be distinctly helpful to the reader, especially if he be a student, if a more emphatic use of subheadings had been made. Even in the case of the general reader, the psychological effect would be great, if no practical purpose were served. More diagrams, tables, and illustrations would also help to lighten the appearance of the book, as well as add to the reader's interest. The space allotted to statistical concepts, in the first chapter, seems a rather unfortunate introduction to the student of the field of social psychology.

The chapters on "Motivation" and "Social Incentives," given at the beginning of the book, emphasize for the student the important role played by motivation in social behavior. The summary and interpretation of the many studies of social incentives is splendid in that it welds together a mass of material at times only loosely related and which, too often, is presented to students in a manner that is apt to confuse them. The most important of the social incentives, competition, rivalry, and coöperation, are analyzed and their influence on behavior, as determined by experimental studies, is reported. An interesting supplement to this would have been an analysis of the most effective social incentives at different ages, including early childhood as well as the later school years and maturity.

The chapters on social attitudes include a splendid discussion of the methods used to measure social attitudes, together with a critical analysis of their merits. A summary of the results of measurement of attitudes includes information about radicalism and conservatism, political attitudes, and attitudes toward nationalities. These chapters are especially important because they bring together the results of recent studies, many of which are so new that they have not appeared in textbooks in the field of social psychology.

More than half of the chapter on "Imitation" is devoted to a discussion of imitation in animals, while studies of imitation in children have been ignored. In fact, little is said about imitation in adults, or the role imitation plays as a socializing factor. The analysis of suggestion, suggestibility, and stereotypes follows rather closely along conventional lines, with emphasis on laboratory studies of older subjects. Once again, too little attention has been given to their influence in the early childhood years.

A differentiation between propaganda and education at the beginning of the chapter on "Propaganda" serves to clarify the concept for the student while at the same time focusing attention on the outstanding characteristics of propaganda. Classes of propaganda, its motivating

forces, and the usual procedures and avenues of propaganda are discussed from a theoretical point of view. Following this, Bird summarizes experimental studies of propaganda, many of which, it seems, might have been introduced into the earlier discussions as illustrations, especially the section dealing with *procedures and avenues of propaganda*. The chapter on "The Behavior of Crowds" offers little that differs from material presented in older texts in social psychology. This is a topic which has been neglected so far as experimental investigation is concerned, so that there was little for Bird to add that had not already been said.

In discussing leadership, Bird has emphasized the outstanding traits of leaders, as intelligence, scholastic achievement, extraversion, as well as social and economic factors. His discussion, as well as the experimental studies he refers to, is limited almost entirely to leadership in adolescence, as seen in high school and college students. An interesting supplement to this would have been sections of the chapter that dealt exclusively with the characteristics of leadership in young children and how they compare with those of older children, adolescents, or even adults.

In the chapter on the "Social Significance of Age," Bird has brought together the extensive studies of the relationship of age to greatest achievement, mental ability, motor ability, imagination, interest, learning, employment, crime, and mental disease. Because of the scope of the subject, he has covered many of these topics in a too scanty fashion, which may give the student the false impression that the role of age is of less significance, socially, than the studies made have proved it to be. Good examples of this criticism are the two-page discussion of "age and crime" and the less-than-a-page discussion of "age and imagination."

The causes of juvenile delinquency, and its relationship to mental deficiency, are discussed in detail in the chapter on "Juvenile Delinquency." An analysis of the personality factors in delinquency, such as emotional disturbances, serves to show that too much emphasis on mental deficiency as a cause is not justified. Methods of readjustment of the delinquent are described with attempts to show what has led to failure or success in each case. Because adult criminality is of as great social significance as juvenile delinquency, a chapter devoted to that topic, or certainly a supplement to the chapter on "Juvenile Delinquency," would serve to complete the topic.

The closing chapter of the book deals with the "Psychological Aspects of War." Biological and social interpretations are given, with proposed substitutes for war offered in a brief, theoretical discussion covering less than three pages. The chapter closes with a section on "measurement of attitudes toward militarism and war." As this chapter is very timely, and because the topic has received less attention in previous books on social psychology than its importance justifies, Bird would have been wise to go into the subject in more detail than he has done. This chapter could have been the most interesting of the whole book had it not been so brief.

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HARTMANN, G. W., & NEWCOMB, T. (Ed.) *Industrial conflict: a psychological interpretation*. (First Yearbook of the Society for the Psychological Study of Social Issues, 1939.) New York: Cordon, 1940. Pp. xi + 583.

If this volume is unearthed by some paleopsychologist a few centuries hence, it may well start a prolonged search for a second volume which, alas, will ultimately be found not to exist. Conflict, he will assume, implies a struggle between two participants. One of these participants, he will find, receives almost continual study throughout this volume; the other is ordinarily dismissed either by references to unattractive stereotypes or by casual representation through studies of 'prospective executives' or foremen. To point this out is not to claim a pro-labor bias in all the contributions; it is simply to indicate that the editors have shown little interest in exploring the employer's side of the conflict.

It may be said in rebuttal that the views and reactions of Capital are only too well known, while those of Labor demand acute investigation. Here the reviewer would ask for references to those articles which provide this information. He will grant at once that newspapers and magazines—as has often been pointed out—tend to present the employer's, rather than the worker's, side of any conflict. He will grant that this is a pernicious state of affairs in a democracy. But he will insist that a survey of industrial conflict must study both sides in detail if it lays claim to being objective and scientific in treating "conflict." If the volume bore the title, *The worker's position in industrial conflict*, many of this reviewer's objections to it would disappear. There is, however, nothing to suggest that a companion volume will investigate with equal care the position of the employer during conflict.

The volume contains twenty-four chapters, varying from clear-cut essays at systematic orientation down to the grossest sort of special pleading. Articles making thoughtful use of controlled investigation rub elbows with others in which well-worn stereotypes parade unblushingly through routine maneuvers. It is a regrettable fact that the worst contributions are bad enough to make well-trained readers discard the volume without ever making contact with certain splendid articles which are scattered here and there throughout its pages. It is hoped that this review will call attention to the latter type.

Part I concerns itself with "Orientation in Time and Space." It begins with two attempts to survey the methods and the role of the social sciences in dealing with industrial conflict. Cantril and Katz discuss "Objectivity in the Social Sciences" and conclude that "detachment from the social scene is not possible nor is it necessarily desirable. Objectivity must come from methods, not motives." Hilgard also questions the desirability of detachment, asserting that "whenever a science reaches any degree of assurance in its statements, the scientist becomes an advocate." From the plane of these articles one is dropped to confront an exercise in the manipulation of stereotypes, performed by Huberman, who proclaims that "the capitalists are interested in keeping wages down, in making profits; the workers are interested in higher wages, shorter hours, better

working conditions, security." Even if one did not resent the definite articles, the stereotyping, and the naïve assumptions of homogeneity, one would be led by later chapters to deny many of the specific points involved in his statement. The two concluding chapters of the section afford discussions, respectively, of the growth of unions in Detroit and of the Johnstown strike of 1937. In both chapters internal evidence suggests that the authors have succeeded in sifting biased sources in an effort to get at basic facts.

Part II deals with "Personal Sources of Conflict." Hoppock and Spiegler defend the thesis that "much industrial conflict has its origin in personal conflict." They point to unrecognized personal frustration as a deep-lying cause of antagonism. Goodwin Watson documents a negative correlation between worker satisfaction and industrial unrest. Theodora Abel presents data from a study of subnormal girls which show that, although these girls can grasp immediate concrete personal problems, they are unable to comprehend matters of union membership and of general industrial relations. Bengé indicates ways in which proper selection of workers tends to reduce industrial maladjustment. The section ends with a parallel presentation of the same industrial conflict as viewed by a plant superintendent and by a C.I.O. organizer.

Part III is labeled "Parties to the Struggle." It opens with one of the real highlights of the volume—Kornhauser's analysis of class structure in America. This is carefully written, thoughtfully documented, and deserves the attention of social psychologists in general. Kornhauser first analyzes at length the roles played by selection and by conditions affecting individual development. He then inquires into the motivation, characteristics, and nature of existing classes, his logic plainly denying any theory of fixed classes in this country and as plainly negating any claims that we have a classless society. By direct contrast, the very next article is a neo-Freudian stereotypy by Burrill Freedman, under the general title, "Stimulus and Response in Economic Behavior."

These samples may be enough to describe the volume as a whole. Those concerned with industrial psychology will read with interest and appreciation a chapter entitled "Methods of Harmonizing Capital and Labor," in which Somers briefly reviews the virtues and shortcomings of current industrial relations programs. The length of S. P. Hayes's article on the psychology of conciliation may deprive him of some readers, but those who follow him through to the end will be impressed by the evidence pointing to the importance of voluntary methods in settling labor disputes. Menefee's article on propaganda will bear reading quite as much for its fairness as for the specific information it contains.

In fine, the volume, except for its continual emphasis on Labor's stand in the conflict, is no more uniform than most symposia. It is to be hoped that the really significant contributions will not suffer because of weak and biased neighbors or because they fail often to suggest that the employer's side may be no less complex and perplexing. This reviewer feels that the volume will occupy an active place on the shelves of many psychologists and that they will choose to send their students to selected chapters rather than to recommend cover-to-cover reading.

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GALLUP, G., & RAE, S. F. The pulse of democracy: the public opinion poll and how it works. New York: Simon & Schuster, 1940. Pp. x + 335.

"Harvard Takes Pulse of Stars," reads the four-column headline of a recent newspaper article in New York City. It would seem that the stars many millions of miles away also pulsate in measurable rhythms. However, while astronomers have been taking the pulse of the stars, psychologists have been taking the pulse of the public. *The pulse of democracy* concerns itself primarily with the work of the American Institute of Public Opinion, founded by the well-known psychologist, George Gallup. However, it discusses and acknowledges the contributions of many others in this field, including psychologists, journalists, sociologists, and practical research men. The co-author, Rae, is a sociologist who, after graduating from the University of Toronto in 1936, received his Ph.D. in sociology from the London School of Economics in 1938. At present he is associated with the Institute of Public Opinion and is an associate of the School of Public Affairs of Princeton University.

This book does not label itself as a treatise on social psychology, and yet that is what it is. As the title implies, its emphasis is on measurements and methodology. If scientific psychology rests on measurements of the individual, then social psychology certainly rests on measurements of the group. To the reviewer, who began his studies in social psychology with Trotter's book on the *Herd* instinct and McDougall's *Social psychology*, and who was moved thereby to write his graduate theses on *the futility of the gregarious instinct* and *all other instincts as scientific concepts*, the present book marks a dramatic climax in the slow transition of social psychology from the realm of speculation to the level of science. As such, it deserves to be a basic text in elementary courses in social psychology, not to say advanced courses. That it will be used as a text in the fields of political science, economics, and sociology can hardly be doubted.

A substantial portion of the book is given to an account of the development of polls, beginning with the *Literary Digest* poll. This poll and its colossal error is used as a background against which to describe the development of the Gallup polls, from their beginning largely as polls by mail to their final reliance entirely on personal, face-to-face interviews. The elements entering into the construction of representative samples are discussed with illustrations. The statistical pages on the laws of chance as applied to sampling, "laws which no government can repeal," may seem inadequate to psychologists acquainted with this subject; however, the growing accuracy of the predictions based on these polls as measured by actual elections, many examples of which are given, reveals a command of statistics in practice which is far more impressive than the most esoteric mastery of theory.

One of the qualities which makes this book unique is its interweaving of theory, method, and practice. Selecting the issues to be polled, determining the wording of the questions, selecting and training the interviewers, meeting the people, the validity of the answers obtained, are all presented from the various points of view. Moreover, they are illumined with a wealth of case material which has both scientific value and dramatic interest. No single development in the history of social

psychology—probably no development anywhere in the history of psychology—has produced such a wealth of scientifically important material in so short a time as have these polls. Few who read this book will doubt that the status of social psychology has been reversed from one with an excess of theory and a dearth of facts to one with a wealth of facts for which existing theories are inadequate.

This wealth of facts even helps to define and limit the range of theory. There is, for example, the frequently expressed belief that polls of public opinion radically influence public opinion itself. In a chapter entitled, "Is There a Band-Wagon Vote?", many specific examples are given to prove that the polls themselves are an insignificant force in determining the trend of public opinion. There are now dozens of instances in which a series of polls show an overwhelming majority shrinking to a small minority—in other words, the very opposite of the band-wagon process.

This book is more than a thesis in social psychology. It presents a political creed and philosophy in forceful and even eloquent fashion. This creed is the belief in the democratic form of government and the efficiency of rule by the people as compared with a dictatorship or fascistic state. However, "unless the ordinary citizen can find channels of self-expression, the common man may become the forgotten man." Public opinion represents the expressions of the citizens in a democracy, and public opinion can keep a democracy alive only to the extent that it can be heard or that it can hear itself. The manner in which public opinion polls help to implement the expression of public opinion is well illustrated by the authors' account of what happened in the Louisiana elections in the winter of 1940. Here a powerfully entrenched political machine might well have maintained itself for another term had it not been for the impartial measurements of public opinion made possible by the poll. "The polls can help to indicate where the pulse of democracy is faint and uncertain, and, by so doing, point to the need for applying restoratives which will strengthen that pulse."

To find a book of such scientific consequence written in a style which reminds one of the famous English essayists is quite an experience. Its logical processes are often expressed in a series of brilliant epigrams. Its ideas, allusions, and quotations reveal a cultural and philosophical background seldom found in a book on measurement. Indeed, the reviewer is compelled to confess something unusual in his experience, namely: a degree of admiration and approval which he has found difficult to restrain.

HENRY C. LINK.

New York City.

YOUNG, K. *Personality and problems of adjustment*. New York: Crofts, 1940. Pp. x+868.

The recent trend among psychologists has been to adopt the broadest definition of personality—covering the whole man, including intellectual, physical, and social qualities as well as character, conditionings, and skills. The actual treatment is, however, usually limited to activity in social situations. Kimball Young's *Personality and problems of adjustment* leans

in the opposite direction. He defines personality (first on p. 181) as "the more or less organized or integrated ideas, traits, attitudes, frames of reference, and habits built into roles (social) and statuses which revolve around the central concept and sense of selfhood, or ego esteem." Though this definition is relatively restricted in scope, his actual treatment is decidedly comprehensive. Name it—a school, concept, method—and it is there, for the most part sympathetically and clearly portrayed, but without much critical appraisal and coördination or synthesis of views.

This intellectual potpourri has its advantages and limitations. It furnishes a general introduction (816 pp. without appendix) to nearly every sort of personality treatment, for beginners or advanced students alike. The first 200 pages are largely a treatment of general psychology, so that no previous knowledge of psychology is necessary for beginners; whereas advanced students can turn almost directly to chapters on Methods of Study, Theories and Types of Personality. The limitation in such a treatment is that of the typical American textbook: many contradictory views and concepts are presented with varying amounts of digestion and without a consistent integration. Although this text should furnish a good review for a terminal senior examination in psychology, it might be confusing to many who are beginners. Behaviorism, Freudianism, Gestalt psychology, and the point of view of G. H. Mead on the self are about equally endorsed.

The second part of the book is more novel ground for psychologists. Under the title "Problems of Personal Adjustment" are included chapters on induction of the child in the family, teacher-pupil relations, mental hygiene for the college student, adjustments in marriage, relation of occupation to personality adjustment, the juvenile delinquent, and the neurotic. This material is loaded with good case studies and wide bibliographical reference. In reviewing considerable data on modern social problems, Young comes to the conclusion that there are many gaps in our knowledge and also suggests that the answers will not be found in mere statistical compilations or in "particularisms" (single causes), but rather in the complex cultural factors revealed only by the case method. The effect of remaining single on the personality of the modern woman, the influences of divorce on home conflicts in the adolescent, sexual freedom in college, occupational security, marginal neurotic states, and many other problems are shown to depend on numerous influences and are capable of varying evaluations. In this reviewer's estimation, the treatment of occupational adjustment is the most barren.

In the last two chapters, the author treats of the balancing effect of religion, art, and avocation in our culture. Religion is considered mainly as a substitute or wish-fulfilling device in a complex world. Our culture presents many conflicts between "fixity and flexibility" or standardization and initiation, and our personalities reflect this conflict.

Young is convinced that many maladjustments arise from the disruption of primary group ideals. By expanding the self to cover social class, state, or nation, loyalties are dispersed; by the allurements of status and the success drive, there is a corresponding loss in personal integrity.

Young's new contribution will satisfy those who want extensive rather

than intensive reading, those who prefer to introduce many topics rather than to make careful discriminations. He identifies (p. 179) the Freudian *super-ego* with the moral "me's" discussed by Mead, whereas the deviate, whether genius or criminal, expresses more *id*. Projection and identification are treated as quite different mechanisms and largely unconscious. The style, or basic "life organization," or personality type, is not considered inherited, but much more fixed than the "social type," or the individual's way of acting in his various groups (p. 326). There is some consideration for the introversion-extroversion dimension, but little or none for the amount or quality of personal attractiveness. There is no discussion of its evaluation, e.g. in rating scales, and yet most of those who speak of personality are thinking of the attractive qualities of the individual.

Many of his concepts seem to have little utility in the measurement or clarification of individual differences; they are not clearly related to drive, poise, or character traits and seem to be off the experimental track. However, the scant reference to personality testing may be in favor of the book; certainly, most of his cautions are justified.

EDWARD S. JONES.

University of Buffalo.

HUSBAND, R. W. General psychology. New York: Farrar & Rinehart, 1940. Pp. xiv + 513.

This book is written with three objectives in mind. The first is to develop a textbook at the introductory level which, in harmony with recent trends in writing such texts, deals with real human beings in their everyday environment. The second is to treat each topic individually and the material as a whole from the genetic standpoint. Finally, psychology is to be presented as a social science rather than as a biological science. Despite the restrictions placed upon the development of the subject in harmony with these objectives, most of the topics typical of an introductory text are included. This is indicated by the titles of the main divisions, namely: Genetic Background; Neural and Sensory Processes; Motivation, Emotions, and Personality; Individual Differences and Intelligence; and Learning, Memory, and Thought.

The fact that there are about forty tables scattered through the book indicates the author's conformity to the current tendency in preparing psychology texts to emphasize statistical as a supplement to experimental data.

He makes no pretense at developing or adhering to any closely knit system of psychology. The treatment is more a survey of facts and principles which are estimated to be of interest and value to the beginning student. In the first place, many psychologists as well as other scientists will be disturbed by the statement of the aim of psychology in general. "The purpose of any science is to predict and control, and this is also true of psychology" (p. 8). The role of psychology as a pure science whose purpose is to describe human experience is ignored or accorded only minor significance.

There is considerable looseness of thinking and of expression in the treatment of some topics which generally have systematic implications. This is found, for example, in the discussion of sensation and perception. "The process of perception is necessary so that messages may be carried from the outside world to the nervous systems." "If a conversation is ignored by an absent-minded friend, the latter had a sensation but experienced no perception." "A page printed in Chinese arouses only pure sensation in most of us, but a literate Chinese experiences perception." "We encounter pure sensation only in such rare instances as looking at a page in foreign characters, hearing a strange language spoken, or smelling an unfamiliar flower" (p. 89). One could rightly contend that there is perception in some degree in each of these examples. Perception may not be absolutely clear, meaning is not at the maximum, but there is meaning of some kind and in some amount in each one of them. The Chinese characters may be recognized at least as characters—yes, as foreign, or even as Chinese, characters. Hearing a strange language spoken is certain to bring some meaning. It is granted, however, that the author is nearer correct when he states that "possibly the visual experience of the person who has just received his vision through an operation is closest to pure sensation" (p. 89).

Relatively little, if any, attempt is made to give a psychological interpretation of motivation. There is the usual attempt to link it with certain physiological states of the organism and with the emotions. But just what the author thinks that a motive is, psychologically, we are given no clear indication.

In the discussion of vocational guidance, the interest factor is inadequately treated. Personality traits loom large, and rightly so, as does the ability of the counselee. But it is our opinion that his purposes and aspirations are perhaps of almost equal importance.

In the opinion of this reviewer, Husband has accomplished two of his objectives, namely: to write an introductory text which is practical and one which treats psychology as a social rather than as a biological science. But the genetic point of view is lost sight of in the development of some topics. The book has interest appeal for the beginning student. It is relatively well written and is adequately illustrated. There is an ample bibliography at the end of each chapter for additional reading. When the student has completed the text, he will have accumulated a vast store of facts concerning psychology, but any systematic framework about which they could be organized will of necessity be relatively weak.

M. O. WILSON.

University of Oklahoma.

MERRY, F. K., & MERRY, R. V. From infancy to adolescence: an introduction to child development. New York: Harper, 1940. Pp. xvii + 330.

This interesting and useful little volume is addressed to two audiences. It is intended to serve as an elementary text for introductory courses in child psychology in teacher training institutions and colleges, and also as a reading source for discussion in parent groups. The authors

avoid the overpopularized style of much recent writing and yet succeed in presenting authoritative experimental data simply and skillfully.

The volume opens with a well-organized and easily grasped account of the historical backgrounds of child study. It summarizes briefly the main concepts which have been used in approaching the problem of the child. The chapter also includes a succinct description of various methods which have been developed in the field of child research.

A chapter on the neonatal period summarizes the essential research work in an engaging manner. The problems of the origins of behavior, however, might have been more thoroughly rounded out, for an account restricted to neonatal behavior is not adequate in sketching origins. Some reference to the work of Windle, Kuo, Coghill, Minkowski, and Hooker would make available to the elementary reader a body of information about fetal behavior which is both interesting and illuminating.

The next six chapters deal with conventional textbook subjects—motor abilities, language, intelligence, learning, motivation, emotion, and play. Four chapters are devoted to newer types of materials such as graphic and musical expression, the child's reading, his interest in radio and the movies. There is a chapter on personality and the inevitable final one on character and religion.

One wonders about the necessity of discussing the question of character in a separate treatment from problems of personality, but this, of course, is an author's privilege. However, the fact remains that the ethical problem is far more closely related to the socialization of the individual than it is to the question of religion.

Under a section on the sources of religion, the authors contrast the "life experience approach" with conventional theological ideas. Perhaps this may mean something, but the term life experience too is a weasel word. If there must be a discussion of religion in books on child development, perhaps it should be part of a chapter on folklore and superstition in childhood, instead of part of one on character.

Finally, there is a small, but vitally interested, group of parents for whom there exists a very special problem. These are the parents who have chosen to keep their physically disabled, or handicapped, or feeble-minded children in the home rather than to send them into institutions. A chapter on the care and management in the home of the blind, or imbecilic, or deformed child, if placed in the excellent setting of this book, would help many parents to meet a tragic situation for which they are totally unequipped either with a body of pertinent information or a set of principles or a knowledge of methods. The existence of this problem guarantees a third audience which would eagerly welcome a book like this one.

Altogether, the volume not only very competently achieves the purposes for which it was written, but does it in a readable manner.

ORVIS C. IRWIN.

State University of Iowa.

ABRAMSON, J. *L'enfant et l'adolescent instables: études cliniques et psychologiques.* Paris: Félix Alcan, 1940. Pp. xix + 390.

Abramson gives in this book the results of an extended attack which she made on a very perplexing problem: the analysis of the instable child. Particularly, she was interested in the mental structure and the evolution of instable infants and adolescents. The material for the study was several thousand children who had been referred to the Clinique Annexe de Neuro-Psychiatrie Infantile either by courts because of delinquency or by families because of intellectual deficiencies and disturbances of character. The methods of investigation included administration of intelligence tests, from which profiles modified from Rossolimo were made; interviews with the parents, of which records were made for use with those of the Neuro-Psychiatric Institute, as the latter aimed specifically at the clinical type of each instable child; and, finally, motor and emotional tests for appraising motivational agencies and affective tendencies.

The book is divided into four parts: (1) a history of the problem, with preliminary notions concerning the study; (2) ninety-two case records, in abbreviated form, representing the mental differences of instable children of school and professional ages; (3) the analysis proper of instability in terms of special intellectual aptitudes, general intelligence, motivation and its components, and affective tendencies; (4) the evolution and development of instability from heredity and the first sign of weakness in infancy.

The result of the study was the disclosing of many problems, a few of which could be answered with some confidence. Instability may be primary, or it may be secondary to other troubles. Primary instability cannot be attributed to a single factor; rather, it results from a number, some of which are indigenous, others exogenous. Family and social life play a more or less important role in the origin as well as in the development of instability; but the specific factors operative in these social orders cannot yet be numbered. The instable shows a pervasive deficiency in the fields of intellect, motivation, and affectivity, and, above all, a lack of equilibrium between the three. The evolution of affectivity seems most defective and hindered, even remaining in a state of childish narcissism. With increase in age of instable children, adaptation is less and less adequate.

While the book is directed primarily toward the needs of the teachers, clinical psychologists, and pediatricians, it should be of value to the child-research worker. The reviewer would have appreciated more discussion of the methods employed, their dependability and validity.

JOHN B. WOLFE.

University of Mississippi.

HOWELLS, T. H. *Hunger for wholeness: man's universal motive.* Denver: World Press, 1940. Pp. 307.

A faith is declared that the fundamental drive of inorganic and organic substance alike is directed toward "wholistic" patterns. In this, Howells takes a step further than Goldstein, in *The organism* (1939), in discussing a philosophy of the universe along with one of man's place in his environment. Theoretical psychologists will be interested in the supporting evidence accumulated by Howells from physics, astronomy, and biology as well as from psychological activities such as play, love, and art.

The threads of the struggle for wholeness are traced in molecular action, in the Andromeda galaxy, in the reproduction of cells, in the vibrations of clang; in religion, in ethics, in liberty and social growth. Illustrations from common sense and religious faith as well as science are presented to support the conception of a dynamic universe driven in all its parts into ever-increasing wholistic patterns. "For we know in part, and we prophesy in part. But when that which is perfect is come, then that which is in part shall be done away (I Cor.: 13)."

Man's "gregarious instinct" in new dress is the capstone for this wholeness everywhere evident. The central force in all things, including man and society, is integration and more integration, the "hunger for wholeness."

It is an erudite and readable philosophy.

DOUGLAS FRYER.

New York University.

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NOTES AND NEWS

THE Tenth Anniversary of the founding of the Wichita Child Guidance Center, Friends University, Wichita, Kansas, was celebrated on November 16, 1940, at which time a dinner was given to honor Dr. Edwina A. Cowan, director of the Center since its founding, who has been identified with the development of child psychology for nearly a quarter of a century. The Hon. Henry J. Allen was toastmaster at the dinner, and Dr. Carl R. Rogers, professor of clinical psychology at Ohio State University, was the principal speaker. In addition, the program for this occasion included informal luncheon discussions, a talk by Dr. James W. Layman, director of the Mental Health Service, Des Moines, Iowa, and open house at the Center for professional workers and the general public.

In the 10 years of its existence over 2400 children and several thousand adults including parents, teachers, social workers, and physicians have made use of the services of the Center. It has been the policy of the Board of Directors to maintain a professionally qualified staff. The Center has no training school facilities, and no students participate in its program for clients.

THE Eighteenth Annual Meeting of the American Orthopsychiatric Association, an organization for the study and treatment of behavior and its disorders, will be held at the Hotel Pennsylvania, New York City, on February 20, 21, and 22, 1941. A registration fee will be charged for nonmembers. A preliminary program may be obtained by writing to the American Orthopsychiatric Association, Inc., 1790 Broadway, New York City.

THE American College Personnel Association's Annual Convention will be held February 18 through 22 at Atlantic City, with headquarters at Chalfonte-Haddon Hall. The Association, numbering over 300 members, is an organization of persons engaged in personnel work at the college level and is one of the 12 groups affiliated with the American Council of Guidance and Personnel Associations. It aims to promote and develop the work of college personnel workers by meeting for the discussion of their common problems, for the exchange of ideas, and for stimulation of new contacts; by the formulation and maintenance of personnel standards; and by coöperative efforts in research, administration, and service. Information concerning the Convention may be obtained from the Secretary, D. D. Feder, Assistant Director, Personnel Bureau, University of Illinois, Urbana, Illinois.

THE U. S. Civil Service Commission is accepting applications for the positions of occupational (\$1800 a year) and junior occupational (\$1620) therapy aides and of recreational aides (\$1800). Applications must be on file with the Commission's Washington office not later than February 10,

if received from states east of Colorado, and February 13, if received from Colorado and states westward. Salaries are subject to a $3\frac{1}{2}\%$ retirement deduction. Applicants must not have passed their forty-fifth birthday. However, this age limit does not apply to veterans granted veteran preference, up to retirement age. Further information and application forms may be obtained from the Secretary of the Board of the U. S. Civil Service Examiners at any first- or second-class post office or from the U. S. Civil Service Commission, Washington, D. C.

